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What Goes Up Must Come Down: The Relationship between the Housing Market Boom and the Subsequent Economic Downturn: Evidence from the MSA Level

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Abstract

Using MSA level data, the paper shows, that geographic areas which experienced the largest housing bubble generally suffered a more serious subsequent economic downturn. More specifically, the paper establishes that MSAs with larger declines in housing permits had larger increases in unemployment. There also appears to be strong evidence of a correlation between the magnitude of a housing boom and the timing of the decline in housing permits. MSAs which experienced larger real housing inflation offered early indications of the subsequent Great Recession.

Keywords: Great Recession, Housing Price Inflation, Price-Rent Ratio, Housing Bubble, Residential Investment, Leading Economic Indicator

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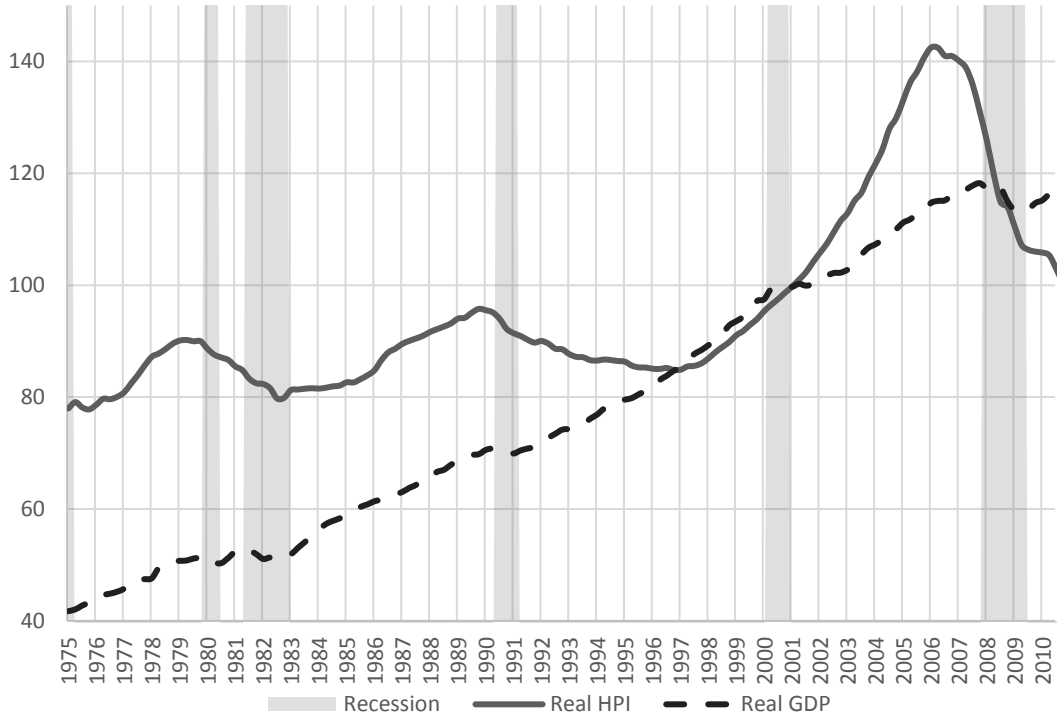
I. Introduction

This thesis is about the housing bubble preceding the Great Recession[1] (December 2007-June 2009) and the subsequent burst of the bubble impacting real economic activity in an unprecedented way. Let me set the tone for the analysis: Figure 1 show the appreciation in U.S. home prices beginning in the mid-1990s.

Figure 1: U.S. Real GDP and Real House Prices, 1975-2011

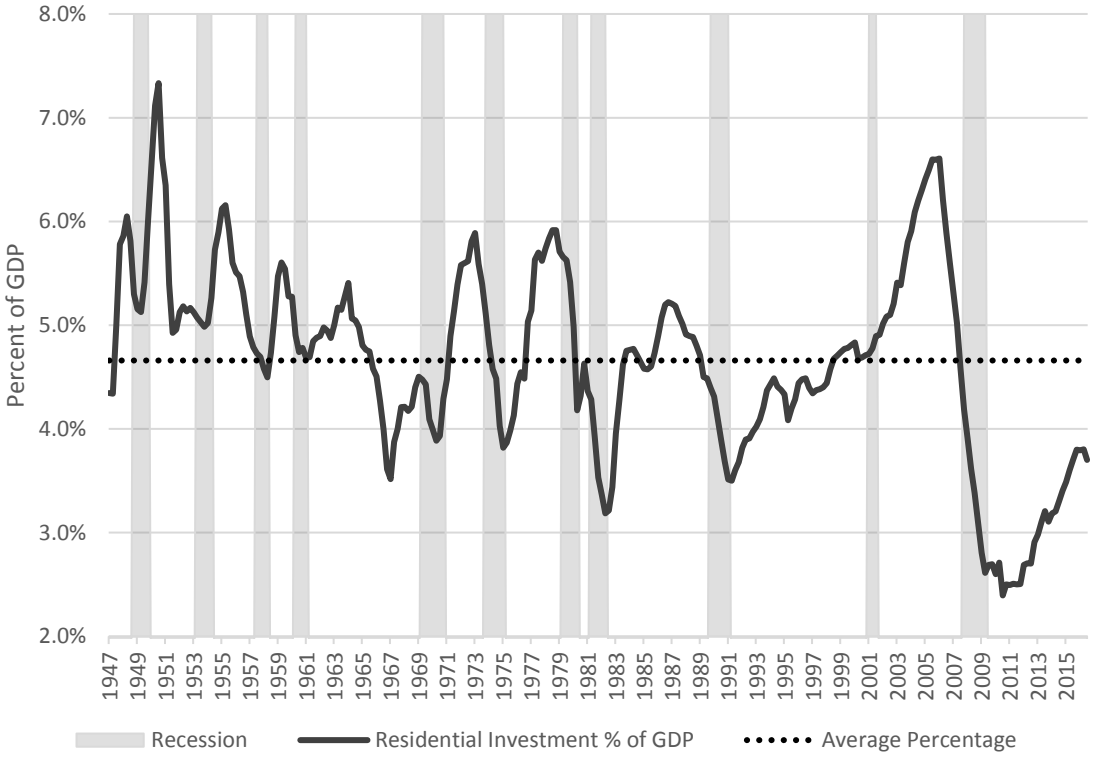


The acceleration in housing prices, driven in part by loose mortgage regulation and low interest rates, eventually became unsustainable (Furman 2014, 1). Coinciding with this development, residential investment accelerated. At its peak in 2006, residential investment rose to a post war historical high of 6.5% of GDP before plunging into the abyss, leading into the most recent recession (see Figure 2). Even now, seven years into

[1] According to the Dating Committee of the National Bureau of Economic Research, the Great Recession started in December, 2007 and ended in June, 2009.

the expansion, residential investment is still at levels hardly seen during the post-World War II period. As a share of GDP, it has only been lower at the end of the Volcker Recession, which was characterized by record high real interest rates, and following the 1990/1991 downturn.

Figure 2: U.S. Residential Investment, Percent of GDP, 1947-2015



The impact of the Great Recession on the wealth of the average American family was devastating – major stock market indices fell nearly 50%, house prices dropped by 27.5% below their peak (on average), the net worth of the typical American family was reduced by 38.8%, and unemployment rose from 5.0% to 10.1% (Bricker, *et al.* 2012, 5). These results represent nation-wide *averages*, and there was much regional variation: the most affected regional areas experienced significantly more severe declines. The 2007 economic collapse caught most Americans completely by surprise, but for the

macroeconomists that knew where to look, the writing was on the wall. Then again, very few of them knew where to look, so it appears.

The explanation of business cycles is one of the primary concerns of macroeconomics. Indeed, the field was developed by Keynes in response to the failure of the Classical Theory to explain the Great Depression. Forecasting aggregate economic activity is a major concern of the discipline. Economic downturns are typically seen as the result of macroeconomic shocks (monetary shocks, oil price shocks) or inventory cycles in automobiles and/or housing. The director of the prestigious Anderson School Forecast at UCLA, Edward Leamer, has emphasized the role that housing starts play in forecasting business cycles. Leamer sees this variable as the primary leading indicator of business cycle movements. "Residential investment offers the best early warning sign of an oncoming recession of the components of GDP" (Leamer 2007, 1). To an outsider, this must be somewhat surprising given that residential investment only makes up a small share of GDP (4.7% on average).

Most of the literature on the role of the housing market in the business cycle uses national aggregate data. This thesis will try to advance the understanding of the topic by investigating Metropolitan Statistical Area[2] (MSA) level data, analyzing those geographical localities that experienced the largest boom in the housing market prior to the onset of the recession. The purpose of the thesis is to first explore to what extent MSAs

[2] Metropolitan statistical areas are geographic entities delineated by the Office of Management and Budget (OMB) for use by Federal statistical agencies in collecting, tabulating, and publishing Federal statistics. A metro area contains a core urban area of 50,000 or more in population. Each metro area consists of one or more counties and includes the counties containing the core urban area.

with larger housing bubbles[3] had larger recessions, and then to additionally examine if these MSAs offer an earlier indication of the recession. Specifically:

- Did MSAs that experienced larger housing bubbles suffer worse recessions?
- Did MSAs that experienced larger housing bubbles offer earlier indications of the recession?

Section II provides background on the Great Recession, and Section III summarizes the existing literature related to the questions above. Section IV develops a metric for housing bubbles for the purpose of this thesis and, using this measure, calculates which MSAs experienced the biggest housing bubbles prior to the Great Recession. The MSAs with the largest real housing price inflation during the national housing boom mostly had the largest housing bubbles. Section V examines to what extent MSAs with larger housing bubbles had larger declines in GDP, and addresses the connection between reductions in housing permits and subsequent rises in unemployment. In general, MSAs with the larger housing bubbles had more severe recessions, and MSAs with larger declines in housing permits had larger increases in unemployment. Section VI examines which MSAs show the earliest signs of the oncoming recession. Decline in housing permits plays a central role in the time sequencing. Section VI concludes with evidence that MSAs which experienced larger housing booms and bubbles also saw earlier housing permit peaks, adding support to the conclusion that these MSAs offered an earlier indication of the upcoming recession.

[3] The Federal Reserve Bank of San Francisco defines the term "bubble" as an asset price that has risen above the level justified by economic fundamentals.

II. Background

"Somewhat frighteningly, each one of us did what was sensible given the incentives we faced." - *Raghuram Rajan*

Many have sought to assign blame for the financial crisis. The political left blames greedy bankers. The right claims it was the government's fault. However, reality, as usual, is more complex. Professor Rajan of the University of Chicago's Booth School of Business offers a broader explanation of the "fault lines" along the tectonic plates of the global economy that pushed the world into a financial earthquake.

One of the first fault lines that formed in the U.S. occurred as total economic output grew in the years before the recession. Middle-class wages in the U.S. stagnated and income inequality rose. Since government cannot easily raise incomes, the political response was to lower interest rates making borrowing easier (Rajan 2011, 34). The Federal Reserve began to implement a dramatic and determined series of policies to reduce the federal funds rate, resulting in its drop from 6.4% in December, 2001 to 1% in July, 2003 (Fast and Loose 2007, 1).

Cheap financing accelerated the growth in the housing market. In addition to many new homebuyers, rising home prices led to real estate speculation, the expectation that prices would keep rising, described by many as the "the greater fool theory" of investing. Buying property for investment accounted for a rising share of the market, and homebuilders responded to the huge demand. The number of housing starts jumped from 1.5 million, at an annual rate, in August 2000 to a peak of 2.3 million in January 2006 (Fast and Loose 2007, 3).

Much of this growth was financed by financial institutions with irresponsible mortgage lending policies due to an industry wide reduction in lending standards. Subprime[4] loans were offered to borrowers with poor credit (Rajan 2011, 57). In 2005, over 60% of all new mortgages in California (and 33% nationally) were structured as negative-amortization[5] or interest-only loans, up from 8% in 2002. These loans were effectively a gamble that prices would continue to rise at least long enough for these homes to be either flipped or refinanced. Otherwise, expensive principal repayments are engineered to kick-in after an initial period (In Come the Waves 2005, 2). Even worse, these loans were usually adjustable-rate mortgages[6] (ARMs), exposing borrowers to changes in interest rates. Issuance of ARMs rose to 50% of all mortgages in 2005 in the states with the biggest price rises (In Come the Waves 2005, 3). Financial institutions were well compensated to assemble different types of risky mortgages and securitize them into lower-risk, diversified, mortgage backed securities (MBSs) (The Origins of the Financial Crisis Crash Course 2013, 2). The belief that pooling mortgages diversified away risk is based on the risky assumption that the individual mortgage risks are not correlated. The pooled mortgages were used to back securities known as collateralized debt obligations (CDOs).[7] The true risk of these CDOs was further hidden by the fact that most of them

[4] The Federal Deposit Insurance Corporation defines subprime as credit or loan arrangements for borrowers with a poor credit history. Subprime loans typically having unfavorable conditions such as high interest rates.

[5] According to the National Association of Realtors, a negative amortization loan is a loan in which the buyer pays less than the interest due and the unpaid principal and interest is added onto the loan, and after an initial period, payments surge as principal repayments kicks in.

[6] An adjustable-rate mortgage, defined by Investopedia, is a type of mortgage in which the interest rate applied on the outstanding balance varies throughout the life of the loan based on a benchmark or index plus an additional spread, called an ARM margin. To start, the rate is fixed for an initial amount of time

[7] According to the Federal Reserve, a CDO is a type of structured asset-backed security. The CDO market encompasses the MBS market.

received AAA ratings by agencies[8] such as Moody's or Standard & Poor's (Beattie n.d., 1). "When easy money pushed by a deep pocketed government comes into contact with the profit motive of a sophisticated, amoral financial sector, a deep fault line develops" (Rajan 2011, 79).

The second fault line that contributed to the crisis was the sizeable and sustained exporting of goods and resources by many countries. Rich countries like Germany and Japan have greatly increased their wealth and national GDP through their export sectors. That strength comes at the cost of weakness in domestic industries such as banking and retailing. China and other poorer countries also built up trade imbalances with the U.S, but from a different path. The financial crises in the 1990s showed them the dangers of relying on money flowing from rich countries. Consequently, they borrowed less and exported more to fuel their economies. Before the crisis, countries like China and countries like Germany, with large trade surpluses and therefore a lot of money in U.S. currency, began to search for foreign investment. That supply of investment met a lot of demand for borrowing in the U.S., resulting in more foolish lending (Rajan 2011, 88).

The third fault line had the effect of widening the crisis. U.S. approach to recession-fighting has been to preserve a social safety net and enhance job creation from resulting under-employment. As a result, U.S. fiscal and monetary policies in the 20th century have supported recoveries generating very rapid results, not the jobless recoveries that appear now to be the norm. Pressure is put on government to cut taxes, increase spending and keep interest rates low. This leads major financial institutions to adjust their own risk profile,

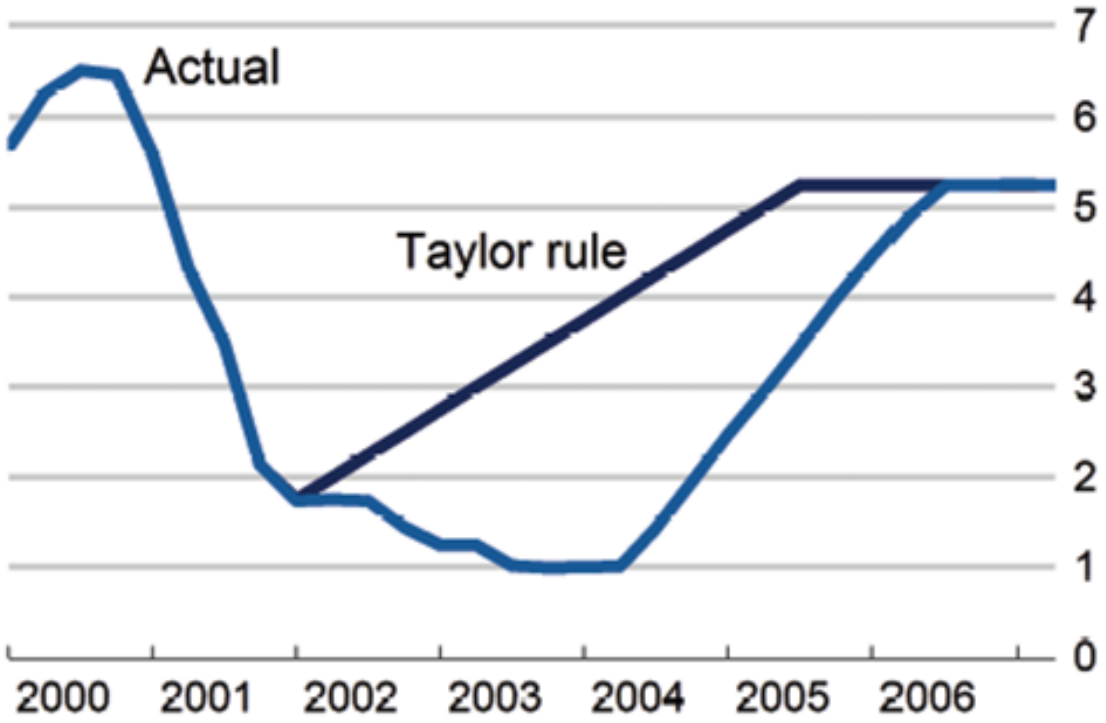
[8] Credit rating is a highly concentrated industry where three agencies, Moody's Investors Service, Standard & Poor's, and Fitch Ratings control approximately 95% of the global market.

appropriately assuming that government would need to keep the money flowing and step in if catastrophe occurs (Rajan 2011).

Large banks heavily invested in mortgage-backed securities because they believed them to be safe while offering high returns. High worldwide demand for U.S. mortgage backed securities and the willingness of lesser-regulated insurers such as AIG to offer default coverage fueled these investments. The boom proved unsustainable when home foreclosure rates and subprime mortgage delinquencies post-2006 substantially increased, resulting in declining value of CDOs and mortgage backed securities (The Financial Crisis Full Timeline n.d., 3). This led to large losses for banks and other financial institutions and many faced bankruptcy. The dire state of the financial system forced the U.S. government to the pass the Troubled Asset Relief Program (T.A.R.P.) in October, 2008. The government bought $426.4 billion in toxic assets from the struggling financial institutions to strengthen the financial sector. The accelerating turmoil resulted in a credit freeze that brought the global financial system to the brink of total collapse (Beattie n.d., 2).

It is widely believed that better monetary policy could have mitigated the effects of the Great Recession. Economist John Taylor claims that the Federal Reserve is at fault for holding the federal funds rate historically low after 2002 (Taylor 2010, 3). Figure 3 shows what policy would have been had it followed the Taylor Rule along with what the actual policy was. This was the greatest deviation from the Taylor rule in over 20 years (Taylor 2010, 4).

Figure 3[9]: Effective Federal Funds Rate



The effect of low interest rates was an acceleration of the home building clock according to Leamer (2007, 5). Low rates made financing cheaper, which led to more risk taking in housing finance, adding fuel to the housing boom. As discussed earlier, these factors helped drive the growth that proved to be unsustainable when housing market finally crashed, leading to a credit crisis, and finally resulting in what we now call the Great Recession.

[9] Source: Taylor, Housing and Monetary Policy 2007

III. Literature Review

There is an enormous amount of literature in economics dedicated to the use of various methodologies behind examining the business cycle. For the purpose of this paper I am centrally focused on literature relating to the housing market.

Leamer (2007, 13) claims that housing is the most important sector in recessions saying, "Of the components of GDP, residential investment offers by far the best early warning sign of an oncoming recession." Since World War II, we have had nine recessions preceded by irregularities in housing. Residential investment decline slows GDP growth before recessions, then reverses contributing more than normal during the second or third quarter of the recessions. Conversely, business investment in equipment and software contribute less in economic weakening before recessions and recover more slowly in the later stages of recessions. Davis and Heathcote's (2001, 1) findings agree with Leamer that residential investment is a leading indicator of a recessionary cycle and add that non-residential investment lags the cycle.

Leamer (2007, 25) goes on to argue that homes don't have a price cycle but rather a volume cycle. That is to say that home prices are sticky while on the decline. Softening in demand results in lower sales volume, but prices do not quickly adjust. Resulting decline in home sales volume correlates with similar declines in jobs in construction, real estate brokerages and finance.

City level data shows that real housing price inflation is strongly influenced by real changes in income, the growth of population, construction costs, and interest rates (Jud and Winkler 2002, 14). The housing market is a city-level phenomenon because housing is a non-tradable good (Ghent and Owyang 2010, 336). Time dummies explain only a quarter

of the variation in city-level house price changes, which suggests that most of the variation in house prices is driven by city-specific factors (Glaeser and Gyourko 2007, 2). State-level data shows that the timing, and in some cases the number of recessionary experiences, vary across regions (Owyang et al. 2008, 4). Some research concludes that growth rates in housing variables appear to slow ahead of city-level peaks, but find no consistent statistical relationship suggesting a city's permits or prices influence its business cycle (Ghent and Owyang 2010, 336).

Gallin (2008, 2) shows that there is empirical support to make the claim that the ratio of housing price to rent is an effective means to analyze comparative valuation in the housing market. He explains that the price-rent ratio can predict future changes in real rents and prices similar to the dividend-price ratio in the stock market. Campbell and Shiller (2001, 1) show that when stock prices are high relative to dividends, future price growth for stocks is subdued. Gallin (2008, 3) argues that the analogous statement is true for the housing market. Periods in which house prices are high relative to rents are often followed by periods where real rent prices appreciate faster than normal, and real housing prices appreciate slower than average. A "bubble" develops in the stock and housing markets when prices of assets deviates from their fundamental value. While fundamental value at the time cannot be calculated because it is unobservable, analysts nevertheless use the price-rent ratio as a way to estimate housing prices relative to fundamental value (Krainer and Wei 2004, 3).

IV. Identifying the Bubble

I collected monthly housing price index data for the U.S. and the forty[10] most populated MSAs from the Freddie Mac Housing Price Index. I then seasonally adjusted the data from June 1996 to June 2016 using EViews Census XII seasonal adjustment tool. For inflation adjustments, I seasonally adjusted the Consumer Price Index "All Items Less Shelter"[11] series from the Bureau of Labor Statistics for the four regions of the United States: Northeast, Midwest, West, and South. I then adjusted each MSA's HPI data for inflation by region using the seasonally adjusted regional CPI data.[12]

After making these adjustments, I discovered that housing prices peaked nationally in March of 2006. In order to capture which MSAs experienced the largest housing boom,[13] I examined the housing price inflation for each MSA over the same time that best encapsulates the overall housing boom.[14] To do this, I calculated the real HPI growth of each MSA for the 52 months from when the U.S. exited the Dotcom Recession in November, 2001 to March, 2006, when real house prices peaked nationally.[15,16]

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[10] The 40 most populated MSAs comprise 46.8% of the total population in 2010 according the Census Bureau.

[11] The Federal Housing Finance Agency recommends to use the Consumer Price Index "All Items Less Shelter" series for inflation adjustments.

[12] Nominal values adjusted for inflation become real values.

[13] I will refer to real housing price index growth as housing price inflation.

[14] I initially thought that in order best capture which MSAs experienced the largest housing price inflation, I would calculate the real HPI growth for a uniform amount of time preceding each MSA's real HPI peak. I had to address the issue that some of the MSAs experienced little change in real housing prices and their real HPIs peaked years before the national peak. As an example, real housing prices for Detroit and Cleveland peaked in 2003.

[15] According to the National Bureau of Economic Research, the Dotcom Recession spanned from March, 2001 until November, 2001.

[16] For the purpose of my analysis, I have defined the duration of the national housing boom as the period from November, 2001 until March, 2006. The housing boom refers to real housing price inflation

Figure 4: Housing Price Inflation, November, 2001 - March, 2006

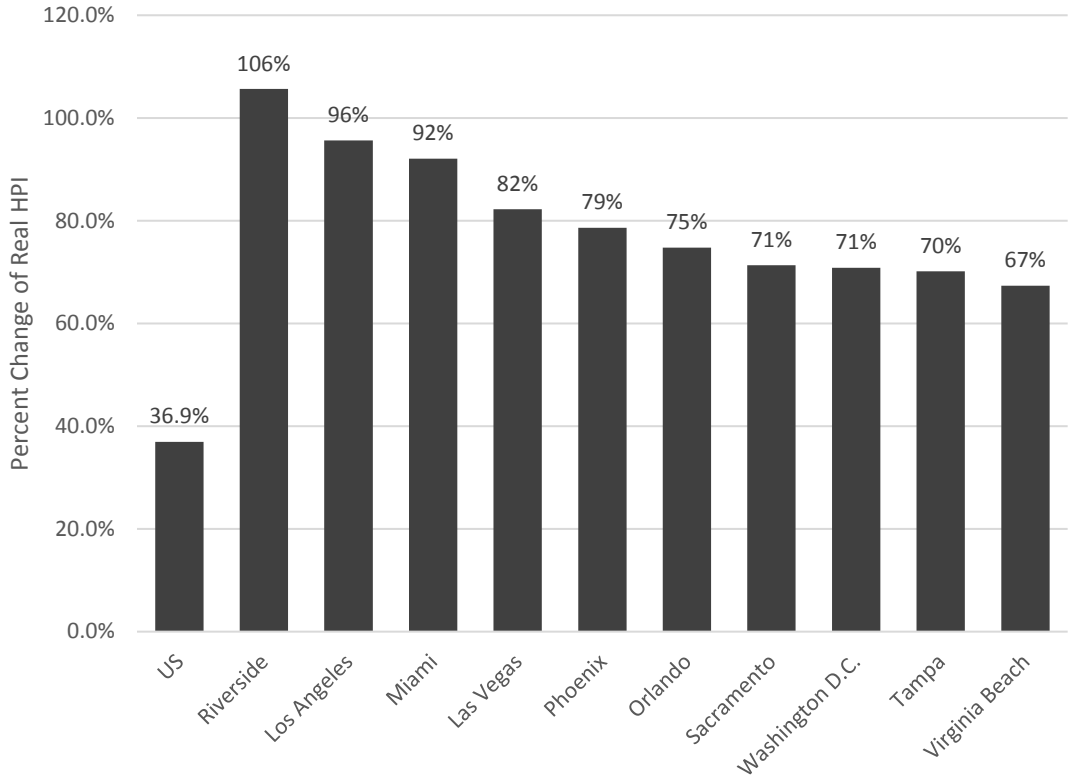
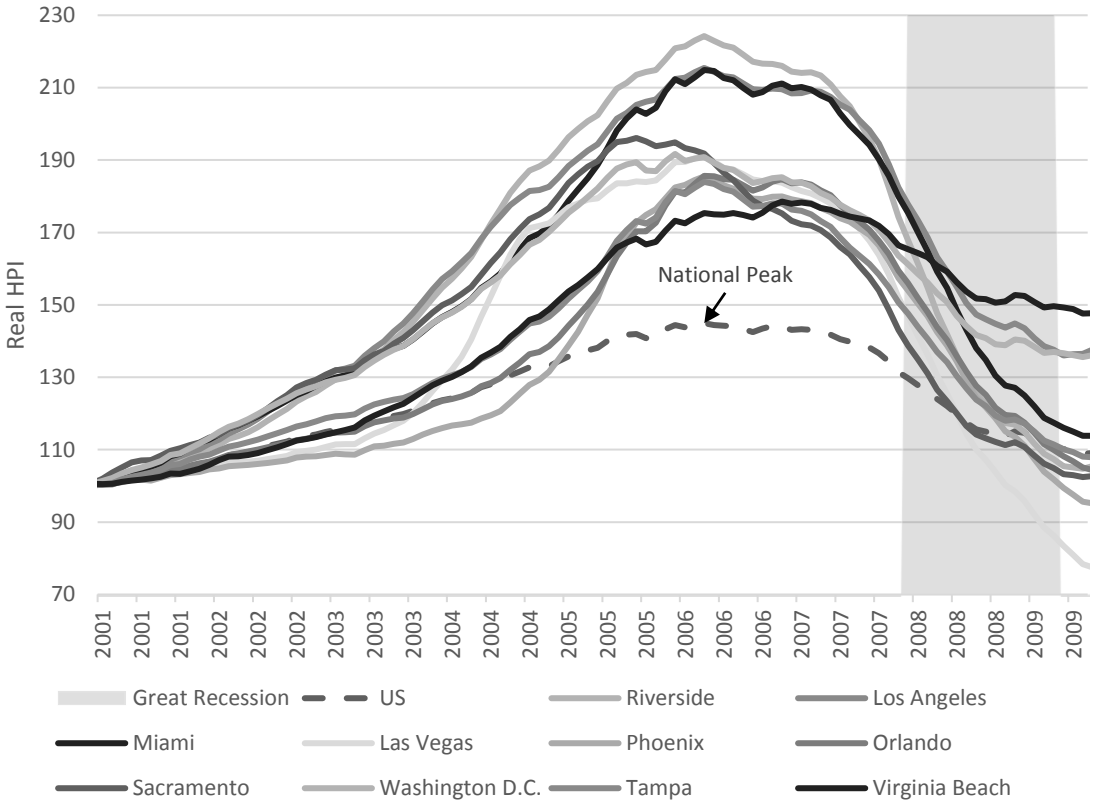


Figure 4 shows the ten MSAs that experienced the largest housing price inflation over that 52-month time span. Interestingly, of the ten MSAs that experienced the real largest real inflation in housing prices, seven are located in coastal states, and three are in California. Riverside-San Bernardino-Ontario experienced the largest boom in housing prices growing 106% during the period, nearly three times the national average.

Figure 5 shows the boom and bust of the ten MSAs that had the most real HPI growth. The U.S. real HPI slowly crept up to its peak in 2006, and slowly declined thereafter. These MSA's experienced sharper increases before their peaks and sharper declines after them. The only exception was Virginia Beach, which peaked 8-months later in November, 2006.

Figure 5: Top 10 MSA Housing Price Inflation, 2001 - 2009



It would be inaccurate to conclude that the 10 MSAs with the greatest real price appreciation in housing are the MSAs with the largest housing bubbles. An examination of price inflation alone does not account for changes in fundamental value of these housing assets in local markets. In order to address this issue, I look at real rent levels and how they relate to real housing prices.

Rents, similar to incomes, are typically tied closely to supply and demand fundamentals. Rent bubbles do not generally occur and therefore are a good metric for the fundamental value of housing. A rapid increase in home prices combined with a flat rental market can signal the onset of a bubble (Krainer and Wei 2004, 2). Economists are hesitant to identify bubbles when they appear to be forming because it is far from obvious exactly how large and how long-lasting a deviation from the norm must be to conclude a bubble

exists. However, given the benefit of hindsight, it is obvious that a housing bubble did form prior to the Great Recession. I will examine which MSAs experienced the largest percentage change in real price-rent ratio over the same period defined earlier (November, 2001 – March, 2006).[17]

I collected monthly and semi-annual rent data for 25[18] of the 40 MSAs and the U.S. average from the Bureau of Labor Statistics. There are two possible series of rent data, "rent of primary residence", and "owner's equivalent rent of primary residence". I collected both series for the U.S. and for each of the 25 MSAs and averaged them. Most previous literature only uses rent of primary residence because it is available for a longer period of time,[19] but I am only concerned with the recent period leading into the Great Recession. The two series are 99% correlated, suggesting the choice of using one or both would not produce significantly different results. I seasonally adjusted the data from June 1996 to June 2016 using EViews Census XII seasonal adjustment tool. To adjust the rent data for inflation, I used the seasonally adjusted CPI "All Items Less Shelter" series from the BLS by region.

[17] The housing bubble refers to percentage increase in the real price-rent ratio.
[18] Rent data is unavailable for Austin, Baltimore, Charlotte, Columbus, Indianapolis, Jacksonville, Las Vegas, Nashville, Orlando, Providence, Riverside, Sacramento, San Antonio, San Jose, and Virginia Beach
[19] Joshua Gallin uses the rent of primary residence series in his article, "The Long-Run Relationship Between House Prices and Rents" (2008) because that series is available longer, and he writes that owner's equivalent rent series is preferable.

Figure 6: U.S. Real HPI and Real RPI, 1983-2015

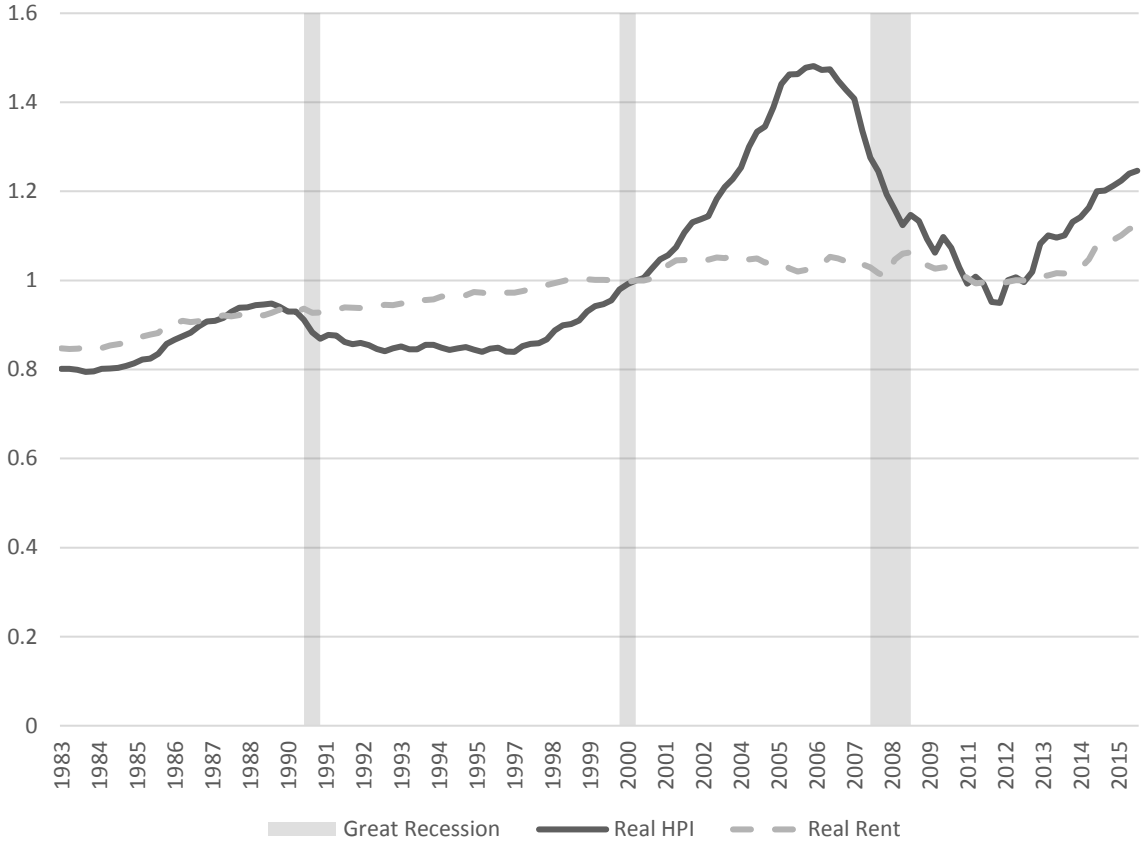


Figure 6 illustrates the typically steady relationship between real rents and real housing prices while also showing the drastic deviation in the ratio in the years leading up to the housing market crash. From November 2001 to March 2006, real rent prices grew only .2% while real housing prices grew 37%.

Figure 7: Increase in Real Price-Rent Ratio vs. Real Housing Price Inflation, 2001 – 2006

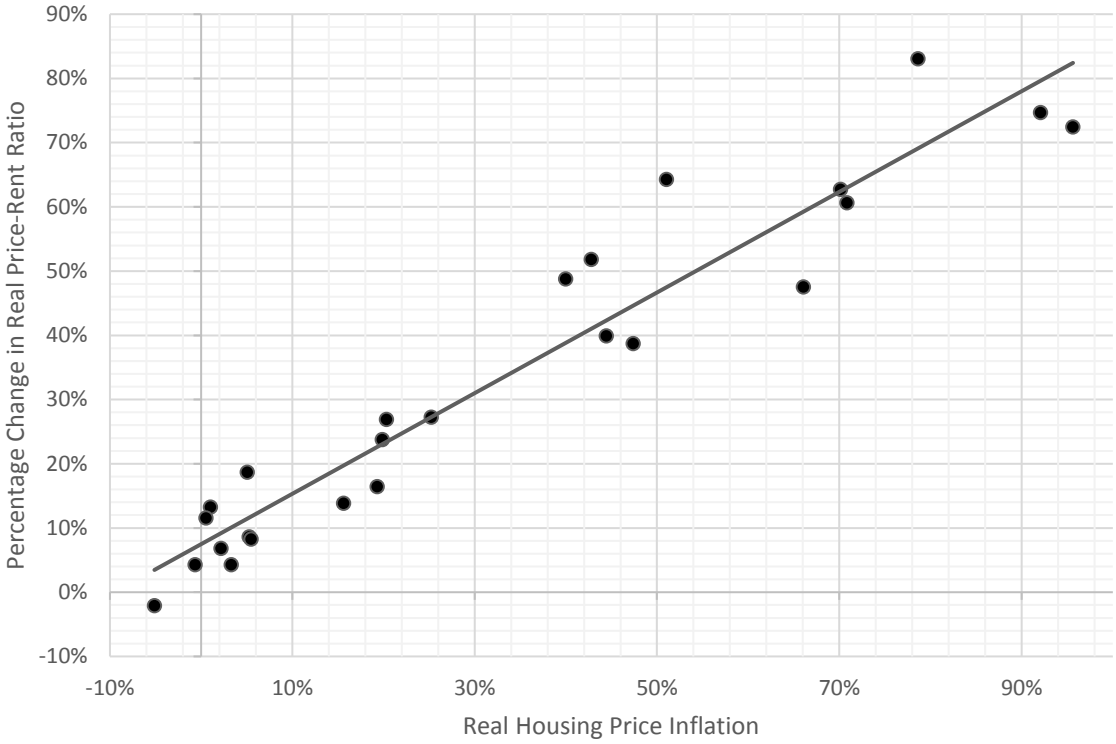


Figure 7 shows the 70% correlation between the real price rent percentage change and the real house price percentage change across the set of 25 MSAs that I examined. Additionally, real growth in house prices explain 92% of the variation of the percentage increase in the real price rent ratio, while real growth in rent prices only explain 23% of the variation of real growth in the price rent ratio (see Appendix 1). In other words, the change in real house prices substantially account for the percentage increase in the real price-rent ratio.

Table 1[20, 21]: Price-Rent Ratio Change and HPI Growth for 25 MSAs

MSA	Real Price-Rent Ratio Change	Real HPI Growth	HPI Rank	Real RPI Growth	RPI Rank
Phoenix	83%	79%	3	-2%	12
Miami	75%	92%	2	10%	3
Los Angeles	72%	96%	1	13%	1
San Francisco	64%	51%	7	-8%	22
Tampa	63%	70%	5	5%	6
Washington D.C.	61%	71%	4	6%	4
Portland	52%	43%	10	-6%	21
Seattle	49%	40%	11	-6%	20
San Diego	48%	66%	6	13%	2
Philadelphia	40%	44%	9	3%	7
New York	39%	47%	8	6%	5
Chicago	27%	25%	12	-2%	11
Minneapolis	27%	20%	13	-5%	19
Milwaukee	24%	20%	14	-3%	16
Atlanta	19%	5%	19	-11%	25
Boston	16%	19%	15	2%	8
St. Louis	14%	16%	16	2%	9
Denver	13%	1%	22	-11%	24
Dallas	12%	1%	23	-10%	23
Kansas City	9%	5%	18	-3%	14
Houston	8%	5%	17	-3%	13
Cincinnati	7%	2%	21	-4%	17
Pittsburgh	4%	3%	20	-1%	10
Cleveland	4%	-1%	24	-5%	18
Detroit	-2%	-5%	25	-3%	15

The real HPI shown in Table 1 provides a ranking of real house price appreciation for the 25 MSAs under examination. The eleven MSAs that have the greatest percentage increase in the real price-rent ratio are all in the top eleven for HPI rank. This agrees with the finding from the regression, that growth in real house prices are the primary driver of growth in real price-rent ratio. The MSAs that provide the best indication of the existence

[20] Table 1 is sorted by largest deviation in the real price-rent ratio.

[21] The HPI and RPI rank columns in table 1 are the real house price growth rank and real rent price growth for these 25 MSAs. Real rent prices that declined are highlighted in red. Top half HPI growth are highlighted green

of a bubble in terms of percentage increase real in price-rent ratio are also those that rank highest in house price inflation (housing boom).[22]

Now that we know which MSAs experienced the largest housing bubble, we will now seek evidence whether a correlation exists between housing bubble and the resulting size of recessions.

[22] The housing bubble refers to percentage increase in the real price-rent ratio. The housing boom refers to real housing price inflation.

V. Housing and the Magnitude of the Great Recession

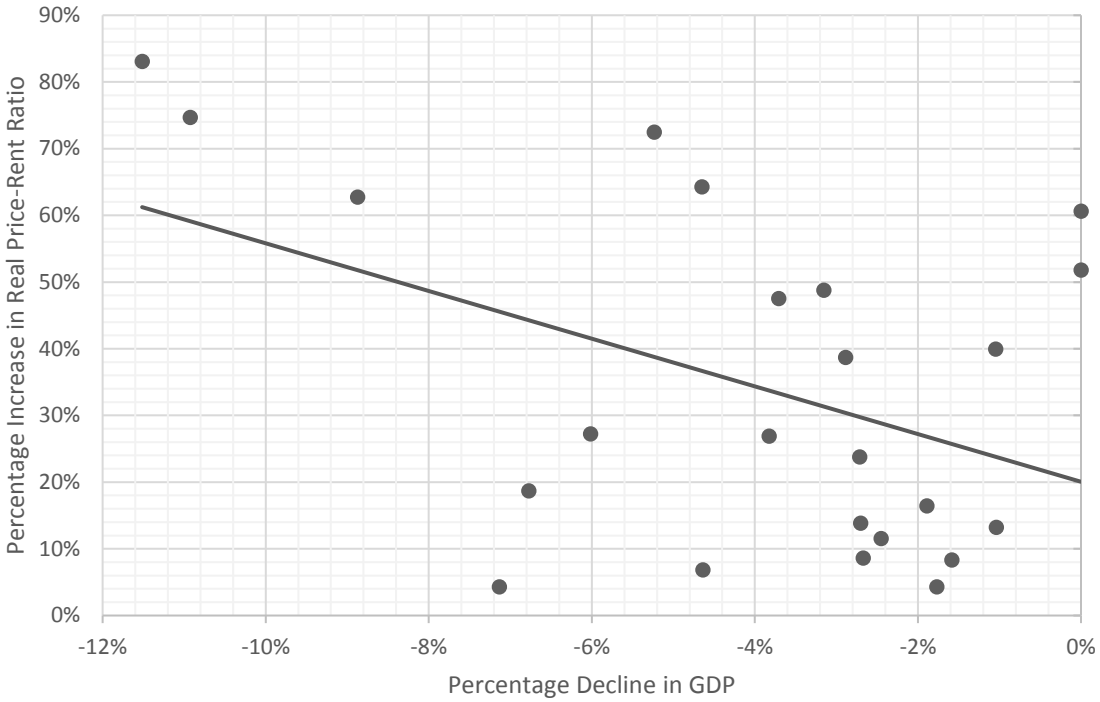
This section is broken in two parts. Part (a) investigates the relationship between the magnitude of the housing bubble and the magnitude of the recession. This will test to see if an MSA that had a large increase in their real price-rent ratio saw larger declines in real GDP and increases in unemployment. Part (b) will take a closer look at that question. It will examine the relationship between the declines in housing starts and increases in unemployment. This examination will test the correlation between the rise in overall unemployment and the increase in unemployment in the housing sector.

V.a. Did Bigger Housing Bubble Translate to Bigger Recession?

To address the question whether MSAs that experienced a larger housing bubble also suffer the worst recessions, I look at percentage declines in real GDP and percentage point increases in unemployment. I collected annual chained-2009 GDP data for the U.S. and for the 40 most populated MSAs from the Bureau of Economic Analysis. I collected monthly unemployment data from the Bureau of Labor Statistics for the U.S. and the set of MSAs. I then seasonally adjusted the data from June 1996 to June 2016 using EViews Census XII seasonal adjustment tool.

I calculated the percentage decline in real GDP during from the Great Recession by taking the difference of each MSA's minimum real GDP after or during the recession and subtracted it by their maximum real GDP before the recession and divided the difference by the maximum value. Figure 8 is a scatter plot of the percentage increase in the real price-rent ratio versus declines in real GDP with a fitted trend line.

Figure 8[23]: Increase in Real Price-Rent Ratio vs. Decline in Real GDP



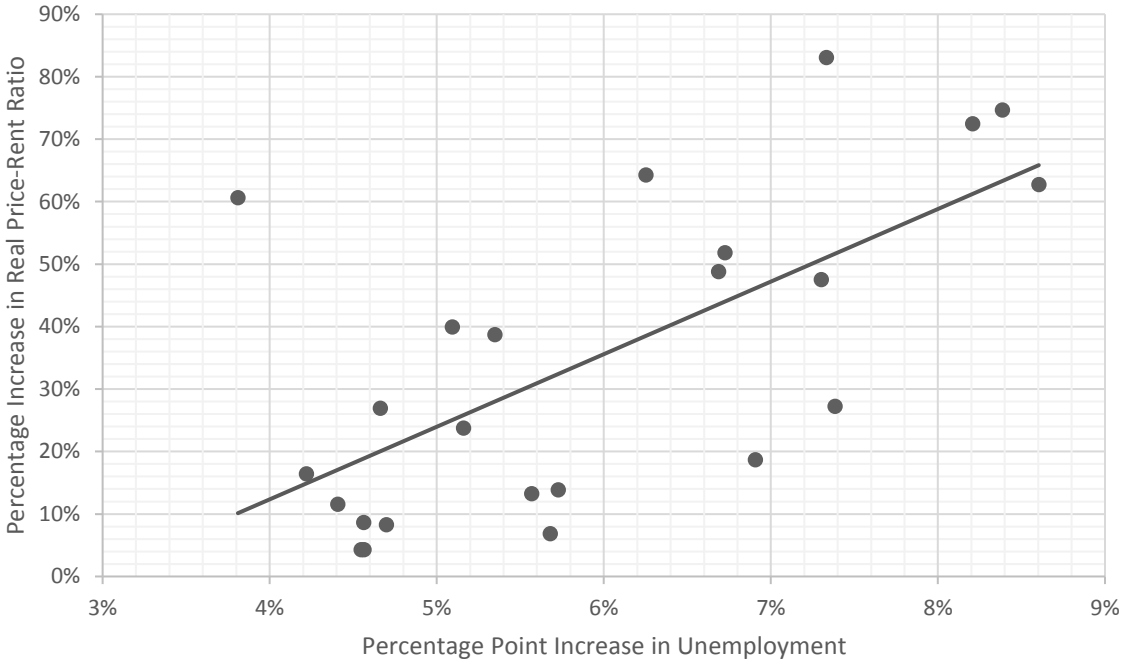
This relationship provides evidence that MSAs with larger housing bubbles had larger recessions. Percentage increase in the real price-rent ratio has a negative 44% correlation with percentage declines in real GDP. Additionally, in a regression of percentage declines in real GDP on the real price-rent ratio change, the coefficient is statistically significant[24] at a 97% confidence-level (see Appendix 2). It is important to note that the calculation for real decline in GDP relies on annual data, therefore comparisons are limited and not as precise as if we were to be able to use monthly data. Unemployment data is available monthly by MSA, so it may be a more robust comparative tool.

[23] Detroit is omitted from the scatter plot because it is an extreme outlier. The trend is still statistically significant with the inclusion of Detroit. However, omitting Detroit increases the significance and better displays the relationship. Detroit's recession began in 2005 because of the decline of its automobile and manufacturing sector. The early recession meant continued large declines in GDP, but no increase in home value.

[24] Typically, regression coefficients are only considered statistically significant if they are significant at a 90% confidence level, meaning P>|t| = .1 or lower.

To find the increase in the level of unemployment from the Great Recession, I took the difference of each MSA's maximum unemployment after or during the recession and subtracted it by their minimum unemployment before the recession. Figure 9 is a scatter plot of the percentage increase in the real price-rent ratio versus increases in unemployment with a fitted trend line.

Figure 9[25]: Increase in Price-Rent Ratio vs. Increase in Unemployment



As expected, this trend agrees with the trend from figure 9 and provides additional evidence supporting the hypothesis that MSAs with larger housing bubbles had larger recessions. Percentage increase in the real price-rent ratio has a 66% correlation with increases in the level of unemployment. In a regression of the percentage point increase in the unemployment rate on the percentage real price-rent ratio change, the coefficient is statistically significant at a 99% confidence-level (see Appendix 2). The relationship

[25] Detroit is omitted from the scatter plot again because it is an extreme outlier.

between the magnitude of the bubble and increases in unemployment is stronger than that of the declines in real GDP. It is reasonable to hypothesize that at least some of the difference is explained by the use of monthly versus annual data.

GDP and unemployment are the two most important metrics for measuring the severity of an economic downturn. Given that the percentage increase in the real price-rent ratio is significantly correlated with the severity of recession, it is safe to say that MSAs that experienced larger housing bubbles in general faced greater recessionary impacts.

V.b. Declines in Housing Starts and Increases in Unemployment

This section examines the relationship between housing starts and unemployment. It is centered around the idea that housing permit declines represent job losses in the housing sector. The sectors most affected would be those closely related to permit generation such as new home construction, but there will also be job loss found in other downstream sectors such as real estate brokerage and mortgage financing. The expectation is that declines in housing starts are highly correlated with a rise in unemployment.

I collected MSA-level monthly housing permit data for 39[26] of the most populated MSAs along with national housing permit data from the Federal Reserve Economic Database. Residential investment is unavailable at the MSA-level, so I instead use housing permits, an excellent proxy because the correlation between residential investment and permit values at the national level is 98 percent. Permits are typically attained one to three months before construction begins[27](Ghent and Owyang, 337).

[26] Housing permit data is unavailable for Providence-Warwick MSA

[27] The U.S. Census Bureau claims that on average, "construction is undertaken for all but a very small percentage of housing units authorized by building permits. A major portion typically get underway during the month of permit issuance and most of the remainder begin within the three following months".

There is a substantial amount of high-frequency variation for MSA-level housing permits, but all data combined exhibits strong low-frequency variation. The MSA permit data must be filtered to isolate the business cycle relationships. I follow the approach of Ghant and Owyang by using an optimal band-pass filter[28] for each series. These filters isolate the cyclical component of a time series by specifying a range for its duration (2010, 337). Once the data is optimally band-pass filtered for each series, I standardize[29] the housing price data and the housing permit data in order to make better comparisons.[30]

Figure 10: Increase in Unemployment vs. Decreases in Housing Permits

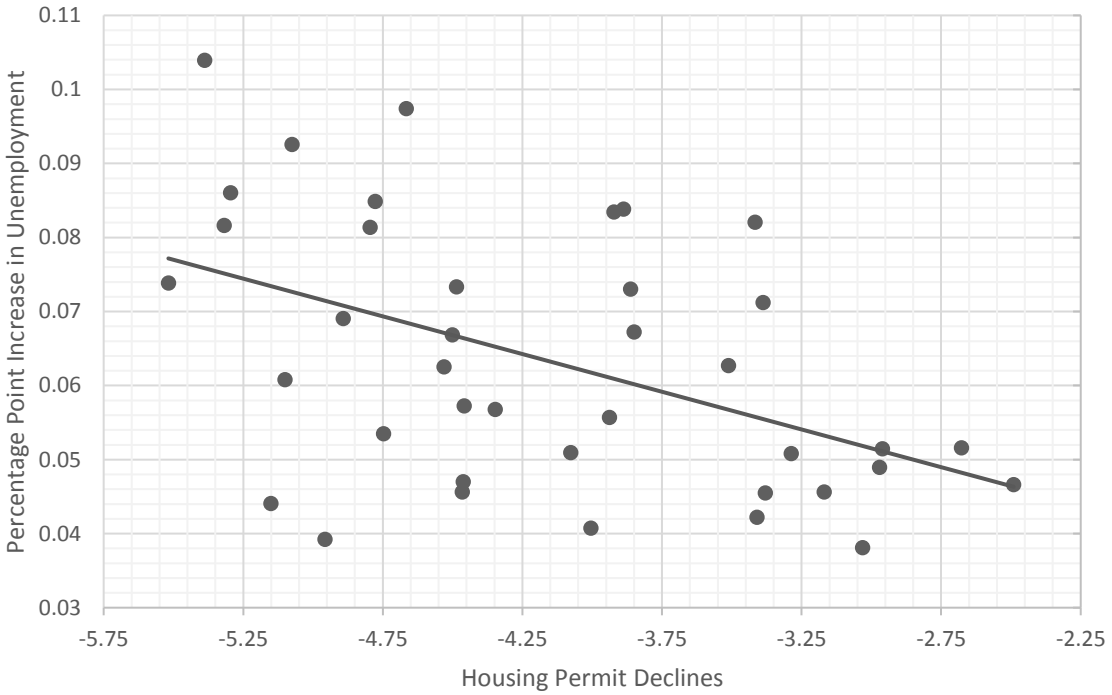


Figure 10 graphically displays the negative 47% correlation between rise in unemployment and declines in housing permits. In a regression of unemployment on

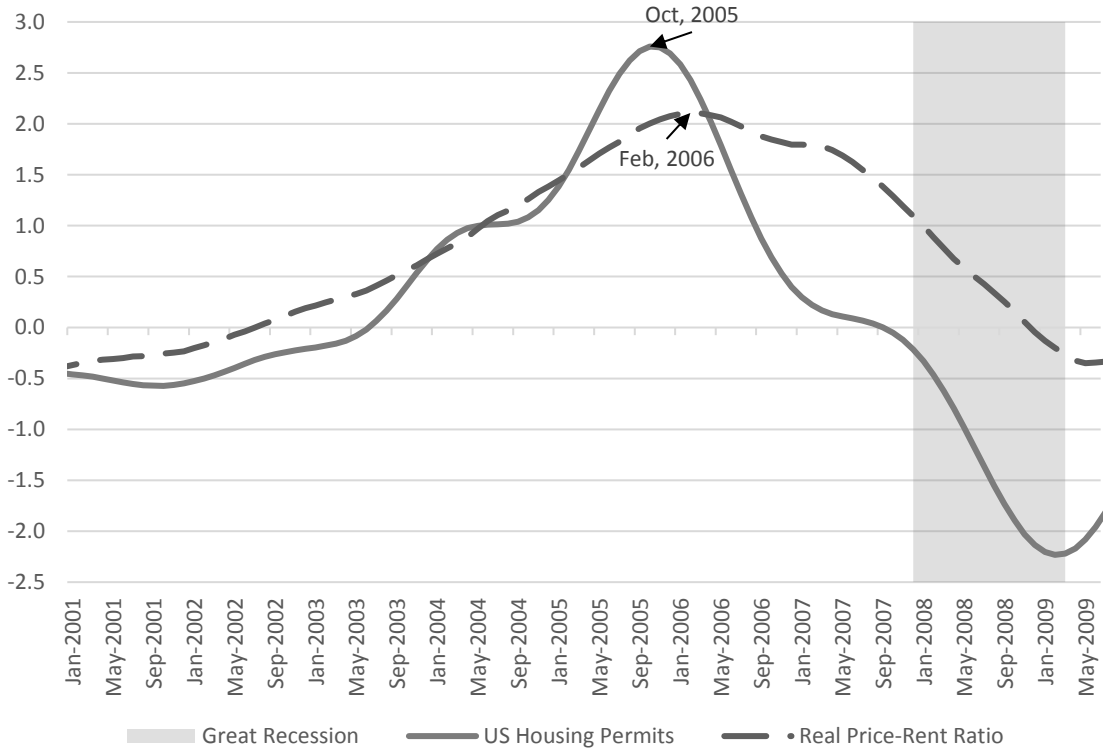
[28] I used EViews to perform the optimal band-pass filter transformation, with cycles of 18 to 96 months.
[29] Standardized values show how many standard deviations from the average that value lies. $Xs = (xi-\mu)/\sigma$ Where Xs is the standardized value, xi is the raw value, μ is the average of the series, and σ is the standard deviation
[30] I used the standardize function in Excel for all series over the same time-span.

housing permit declines, the coefficient is statistically significant at a 98% percent confidence level (see Appendix 3). However, one can see that there is still a significant amount of deviation from the fitted line. Housing permit decline only explains 22% of the variation in the rise of unemployment.

VI. Relationship Between Magnitude of Housing Bubble and Timing of the Decline of Housing Permits

Decline in housing starts are known to be one of the best leading economic indicators[31] of a recession. Leamer (2007, 16) found that residential investment contributes to weakness in GDP most before recessions. This is to say that declines in housing starts lead overall economic downturns. When addressing a leading economic indicator and examining its efficacy, questions of timing are of most importance, not of magnitude. Section V(b) addressed questions dealing with the magnitude of housing permit declines. This section examines its timing.

Figure 11: United States Real Price-Rent Ratio and Housing Permits, 2001 - 2009



[31] According to the National Bureau of Economic Research, a leading indicator is a measurable economic factor that changes before the economy starts to follow a particular pattern or trend.

As Figure 11 clearly illustrates, U.S. new construction housing permits peaked before the real price to rent ratio peaked; both peaking well before the start of the recession. In order to examine if the MSAs showing evidence of being in a housing bubble offered an earlier indication of recession, I analyze the dates of the housing permit peaks and compare these dates to the national peak, October, 2005.

Figure 12[32]: Increase in Price-Rent Ratio vs. Timing of Housing Permit Decline

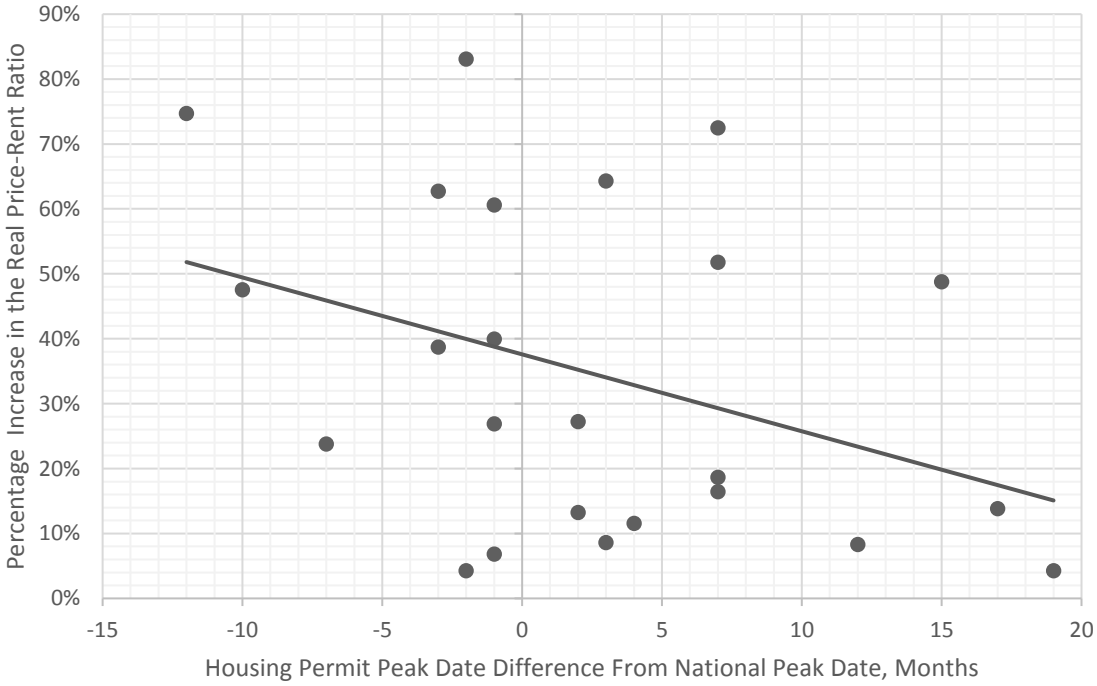


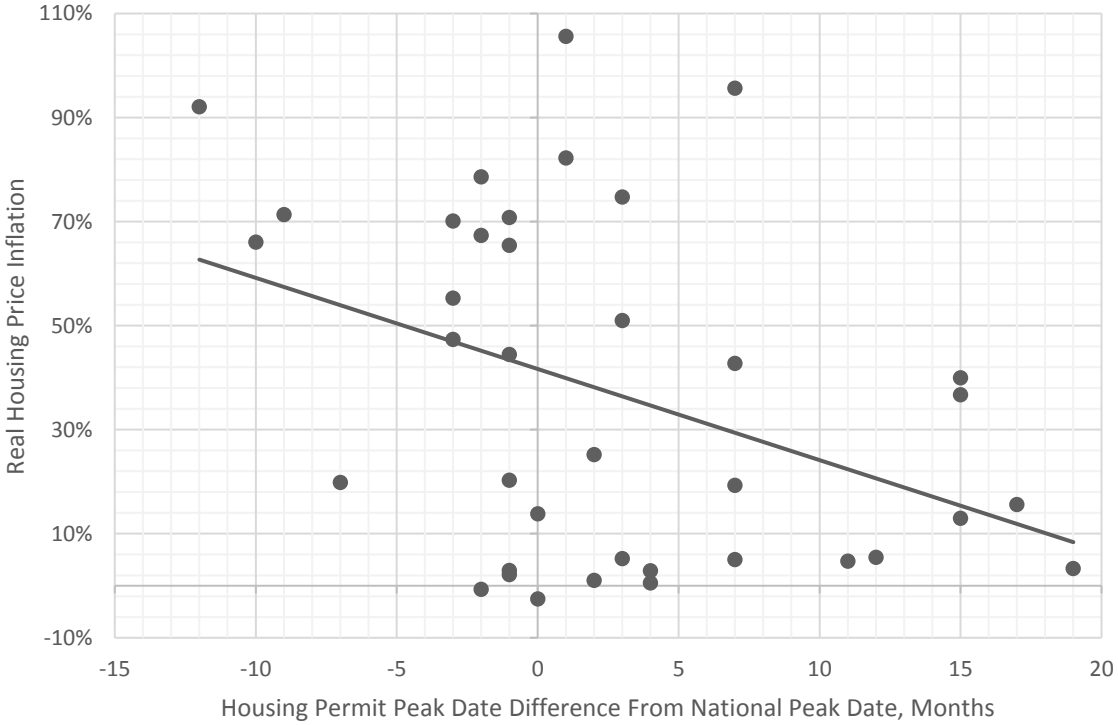
Figure 12 shows that there exists a substantial relationship between real increase in the price-rent ratio and the timing of the decline in housing starts. Housing starts decline sooner in MSAs that demonstrate a larger housing bubble. However, this appears to provide a relatively weak relationship; there is only a negative 37% correlation between the two series. Nevertheless, in a regression of housing permit decline on the real price-rent ratio

[32] Detroit is omitted from the scatter plot again because it is an extreme outlier.

change, the coefficient is significant at the 93% confidence level (see Appendix 4), offering statistically significant support.

Evidence suggests that deviation in the real price-rent ratio is a good indicator of a bubble, but real housing price inflation is likely to be more highly correlated with housing permits. Regressions show that neither real housing price appreciation, nor real increases in the price-rent ratio are significant coefficients in explaining the magnitude of increases and declines in housing permits (see Appendix 5). Nevertheless, it will be helpful to analyze the timing of the decline in housing permits in relation to housing price inflation for the full set of 40 MSAs.

Figure 13[33]: Housing Price Inflation vs. Timing of Housing Permit Decline



[33] Detroit is omitted from the scatter plot again because it is an extreme outlier.

Figure 13 shows that there exists a stronger relationship between housing price inflation and the timing of the decline in housing starts. Housing starts declined sooner in MSAs with larger increases in house price inflation. This is only a slightly stronger relationship; there is only a negative 39% correlation between the two series. In a regression of housing permit decline on the real housing price appreciation, the coefficient is significant at the 99% confidence level (see Appendix 4).

Figure 14: Timing of Housing Permit Decline

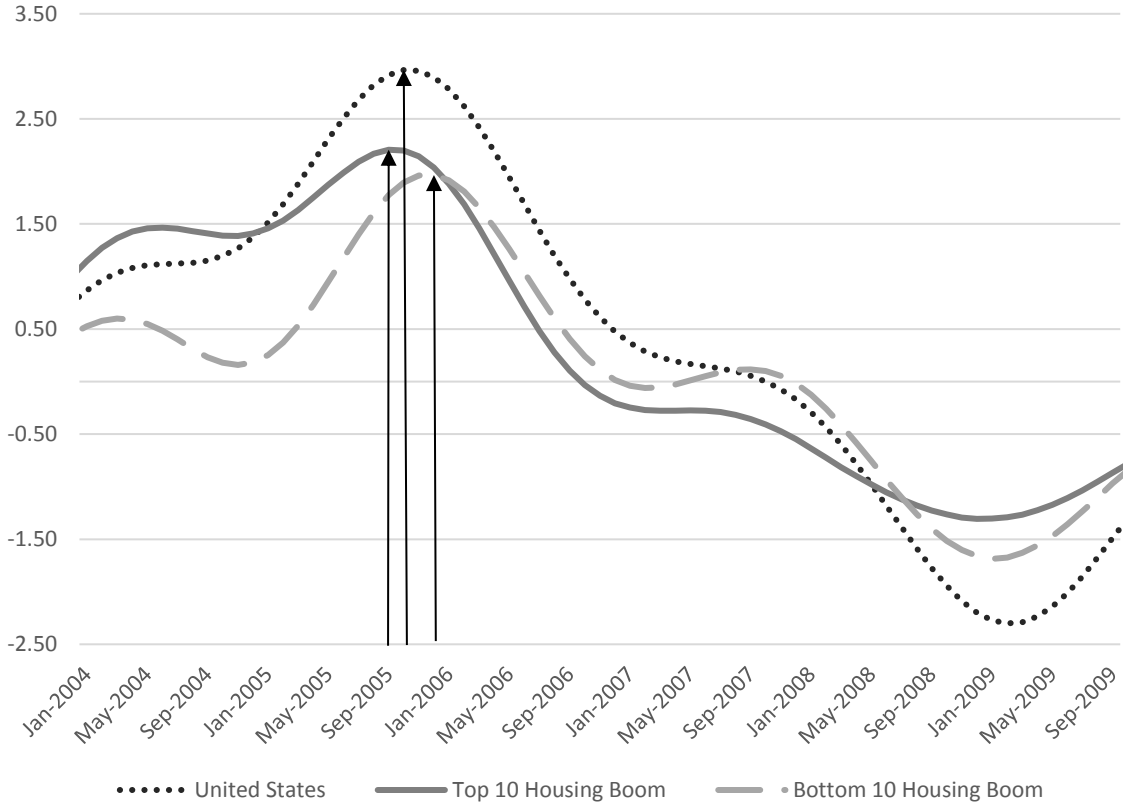


Figure 14 illustrates the overall relationship between the timing of the peaks and the housing boom. The top 10 MSAs with the largest boom on average peak one month before the national average, and the bottom 10 MSAs peak two months after the national average. There is a great deal of variation in the timing of MSA level housing permit peaks,

however general housing permits demonstrate peaks sooner among those MSAs with larger housing bubbles and larger real housing booms.

VII. Conclusion

This thesis investigates the relationship between the Great Recession and the housing market at the MSA-level. To summarize, I initially examined whether MSAs that experienced the largest bubble in housing prices relative to rent prices subsequently also saw the greatest recessionary downturn. Percentage increases in the real price-rent ratio are positively correlated to declines in real GDP and increases in unemployment. The data supports the hypothesis that MSAs which experienced larger housing bubbles suffered a more severe economic decline. Contradictory to previous finding in the literature (Ghent and Owyang 2010), there is a consistent relationship between MSAs housing permit activity and its influences on the local MSA business cycle: there is a statistically significant relationship between housing permit declines and the rise in unemployment at the MSA-level. It is likely that I found this relationship while previous literature did not as a result of focusing on the Great Recession.

The second question this thesis examines is whether MSAs that experienced larger housing bubbles offer any earlier indication of the upcoming recession. I address this question by examining the timing in which housing permits peaked across MSAs. The timing of these peaks in permit activity varied greatly across the MSAs. There is evidence of a significant correlation between MSAs seeing the largest bubbles and housing permits peaking earlier relative to the downturn.

This thesis did not attempt to address the relationship between consumer debt and the housing bubble. Many of the regions of the United States that had the largest housing boom had the highest concentration of adjustable rate, negative-amortization, and interest-only mortgages (In Come the Waves, 2005). Subsequent research should focus on the

questions addressed in this thesis considering this aspect of how the rapid increase in consumer debt and resulting homeowner foreclosures responded to local MSA price bubbles and the timing of the collapse.

Appendix

1.

VARIABLES	(1) Increase in Housing Bubble	(2) Increase in Housing Bubble
Real Housing Price Inflation	0.784*** (0.0511)	
Real Rent Price Inflation		1.799*** (0.517)
Constant	0.0748*** (0.0154)	0.347*** (0.0452)
Observations	25	25
R-squared	0.920	0.230

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.

VARIABLES	(1) GDP Decline	(2) Unemployment Increase
Percentage Increase in Real Price-Rent Ratio	-0.0552* (0.0285)	0.0372*** (0.00864)
Constant	-0.0214** (0.00881)	0.0462*** (0.00275)
Observations	24	24
R-squared	0.197	0.433

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3.

VARIABLES	(1) Unemployment Increase
Housing Permit Decline	-0.0101***
	(0.00290)
Constant	0.0211*
	(0.0113)
Observations	39
R-squared	0.222

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.

VARIABLES	(1) Housing Permit Peak	(2) Housing Permit Peak
Percentage Increase in Real Price-Rent Ratio	-11.47* (6.091)	
Real Housing Price Inflation		-8.815** (3.331)
Constant	6.546** (2.661)	5.804*** (1.758)
Observations	24	38
R-squared	0.136	0.154

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.

VARIABLES	(1) Housing Permit Increase	(2) Housing Permit Decline	(3) Housing Permit Increase	(4) Housing Permit Decline
Real Housing Price Inflation	0.371 (0.385)	-0.0963 (0.397)		
Percentage Increase in Real Price-Rent Ratio			0.319 (0.530)	0.0593 (0.533)
Constant	2.228*** (0.174)	-4.129*** (0.194)	2.111*** (0.223)	-4.132*** (0.252)
Observations	39	39	25	25
R-squared	0.025	0.001	0.016	0.000

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Data Appendix

Variables	Methodology	Source
Real housing price inflation (real housing boom increase)	Percentage increase in the real HPI from November, 2001 to March, 2006	Freddie Mac Housing Price Index
Real rent price inflation	Percentage increase in the real RPI from November, 2001 to March, 2006	Bureau of Labor Statistics
Real percentage increase in the price-rent ratio (real housing bubble increase)	Percentage increase in the real price-rent ratio from November 2001 to March, 2006	Freddie Mac Housing Price Index and Bureau of Labor Statistics
Housing permit peak	Difference in date of peak from the national peak in months	Federal Reserve Economic Database
Housing permit increase	Difference between housing permit peaks before the recession and average monthly housing permits. Data is standardized, so the increase is simply the peak value.	Federal Reserve Economic Database
Housing permit decline	Difference between housing permit peaks before the recession and housing permit troughs during or afterwards	Federal Reserve Economic Database
Increase in unemployment	Difference between unemployment troughs before the recession and unemployment peaks during or afterwards	Federal Reserve Economic Database
Percentage decline in GDP	Difference between GDP peaks before the recession and GDP troughs during or afterwards	Bureau of Economic Analysis

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